

CLAIMS

1. A device for detecting the direction of a light source, the device comprising:
- 5 a lens for receiving light from the light source and projecting a light pattern;
- a light sensing surface for receiving the light pattern from the lens and producing an output signal in response thereto; and
- 10 a processor responsive to the output signal;
- wherein the processor is operable to determine the direction of a light source from the output signal.
- 15 2. A device in accordance with claim 1, wherein the lens is a pin-hole lens.
3. A device in accordance with claim 1, wherein the lens is a holographic lens.
4. A device in accordance with claim 1, wherein the light sensing surface
- 20 comprises a plurality of light sensing elements.
5. A device in accordance with claim 1, wherein the plurality of light sensing elements include elements sensitive to light in a plurality of spectra.
- 25 6. A device in accordance with claim 1, wherein the light sensing surface comprises a CCD array.
7. A device in accordance with claim 1, wherein the light sensing surface comprises a photo-diode array.

8. A device in accordance with claim 1, further comprising an analog-to-digital converter coupled to the light sensing array and the processor, and operable to convert the output signal into a digital output signal and provide the digital output signal to the processor.

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9. A device in accordance with claim 1, further comprising a display coupled to the processor.

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10. A device in accordance with claim 1, further comprising a memory coupled to the processor.

11. A device in accordance with claim 1, further comprising a communication transmitter coupled to the processor.

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12. A device in accordance with claim 1, further comprising a communication receiver coupled to the processor.

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13. A device in accordance with claim 1, wherein the processor includes a demodulator.

14. A device in accordance with claim 1, wherein the light sensing surface is flat.

15. A device in accordance with claim 1, wherein the light sensing surface is concave.

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16. A method for determining the direction of a light source, the method comprising:

5 receiving light from the light source;

projecting the light onto a light sensing surface;

10 determining the position of the projected light on a light sensing surface; and

mapping the position to a direction.

17. A method as in claim 16, wherein the mapping uses a look-up table indexed by the position of the projected light on the light sensing surface.

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18. A method for determining the position of a device the method comprising:

receiving light from a light source;

projecting the light onto a light sensing surface to form a projected image;

receiving a signal from the light sensing surface, the signal being indicative of the position of the projected image on the light sensing surface;

retrieving stored information from a memory; and

determining the position of the device from the signal and the stored information;

19. A method in accordance with claim 18, wherein the stored information includes the location of the light source.

20. A method in accordance with claim 18, wherein the stored information includes the vertical position of the device.

21. A method in accordance with claim 18, wherein the stored information includes the orientation of the device.

22. A method in accordance with claim 18, wherein the stored information includes previously measured positions of a projected image from other light sources and the locations of those light sources.

23. A method in accordance with claim 18, wherein the stored information includes previously measured directions to other light sources and the locations of those light sources.

24. A method in accordance with claim 18, further comprising:

measuring the intensity of the collimated beam;

determining the distance from the device to the light source; and

storing the distance in the memory, wherein the stored information includes the distance.

25. A method in accordance with claim 18, further comprising transmitting the position of the device to other devices in a network of devices.

26. A method in accordance with claim 18, further comprising displaying the position of the device on a display.

27. A method in accordance with claim 18, further comprising storing the position of the device in the memory.

28. A method in accordance with claim 18, wherein the determining the position of the device from the signal comprises:

selecting a demodulation signal corresponding to a light source;

demodulating the sensor signal with the demodulation signal to obtain a demodulated signal;

determining the position of the collimated beam on the light sensing surface in accordance with the demodulated signal; and

retrieving the location of the light source from the memory.

29. A method in accordance with claim 18, wherein the determining the position of the device from the signal comprises:

5 selecting a light source;

 selecting components of the sensor signal in accordance with the spectrum of the light source to obtain a filtered sensor signal;

10 determining the position of the collimated beam on the light sensing surface in accordance with the filtered sensor signal; and

 retrieving the location of the light source from the memory.

15 30. A method in accordance with claim 18, further comprising transmitting the position of the projected image to other devices in a network of devices.

31. A method in accordance with claim 18, further comprising transmitting the direction to a light source to other devices in a network of devices.

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32. An object location system comprising:

a first light source located at a first known position; and

a detection device for detecting light from the light source and determining the direction to the light source, the device comprising:

a lens for receiving light from the first light source and projecting a light pattern;

a light sensing surface for receiving the light pattern and producing an output signal in response thereto; and

a processor responsive to the output signal;

wherein the processor is operable to determine the position of the detection device from the output signal and the known position of the first light source.

33. An object location system in accordance with claim 32, wherein the lens of the detection device is a pin-hole lens.

34. An object location system in accordance with claim 32, wherein the light sensing surface of the detection device comprises a plurality of light sensing elements.

35. An object location system in accordance with claim 32, wherein the first light source is modulated.

36. An object location system in accordance with claim 32, further comprising:

one or more additional light sources located at additional known positions;

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wherein the processor is operable to determine the position of the detection device from the output signals due to each of the first and additional light sources and the first and additional known positions of the light sources.

10 37. An object location system in accordance with claim 36, wherein the first light source and the additional light sources are each modulated by a different modulation pattern.

15 38. An object location system in accordance with claim 36, wherein the first light source and the additional light sources each emit light with a different spectral character.

39. An object location system in accordance with claim 36, wherein the first light source and the additional light sources each emit light at different times.

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40. An object location system in accordance with claim 32, further comprising:

a controller coupled to the first light source and operable to control a characteristic of the first light source.

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41. An object location system in accordance with claim 32, wherein the processor determines a distance from the detection device to the first light source according to the intensity of the light falling on the light sensing surface.

30 42. An object location system in accordance with claim 32, wherein the light source is one of an incandescent bulb, a fluorescent lamp, an LED and a laser diode.

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43. An object location system in accordance with claim 32, wherein said detection device further comprises a first transmitter for transmitting the location of the detection device, said system further comprising:

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a plurality of sensing devices, each sensing device comprising:

a second transmitter for transmitting signals to other sensing devices;

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a receiver for receiving signals from other second transmitters and from the first transmitter; and

a processor coupled to the second transmitter and the receiver,

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wherein each of the plurality of sensing devices is operable to determine its position relative to other sensing devices and relative to the detection device.

44. An object location system in accordance with claim 43, wherein a sensing device of the plurality of sensing devices includes further comprises a sensor for
20 sensing a property selected from the group consisting of temperature, moisture, chemical composition, pressure, motion and light intensity.

45. An object location system in accordance with claim 32, wherein the detection device is incorporated in an object that is to be tracked wherein the detection device
25 further comprises a transmitter for transmitting the location of the detection device.

46. An object location system in accordance with claim 45, further comprising:

a receiver for receiving the location of the detection device transmitted from
30 the transmitter of the detection device.

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47. An object location system comprising:

a first light source located at a first known position;

5 a detection device for detecting light from the light source, the device comprising:

a lens for receiving light from the first light source and projecting a light pattern;

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a light sensing surface for receiving the light pattern and producing an output signal in response thereto;

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a device processor responsive to the output signal and operable to determine the position of the light pattern on the sensing surface; and

a transmitter for transmitting the position of the light pattern on the sensing surface; and

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a receiver for receiving the position of the light pattern on the sensing surface; and

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a central processor coupled to the receiver and operable to determine the location of the detection device from the receiving the position of the light pattern on the sensing surface and the known position of the first light source.

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